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FINAL REPORT

NUMERICAL METHODS AND APPROXIMATION AND MODELLING

PROBLEMS IN STOCHASTIC CONTROL THEORY

Brown University
Lefschetz Center for Dynamical Systems
Division of Applied Mathematics
Providence, R. I. 02912

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August 20, 1981

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<u>SUMMARY OF SCIENTIFIC PROGRESS</u>,   July 1980 - June 1981

<u>Papers by H.J. Kushner</u>

Diffusion approximations for non-linear phase-locked loop type systems
with wide band inputs.

Stochastic approximations with discontinuous dynamics and state dependent
noise, w.p.1 and weak convergence.

An averaging method for stochastic approximations with discontinuous
dynamics.

A cautionary note on the use of singular perturbations.

Convergence and rate of convergence of a recursive identification and
adaptive control method which uses truncated estimators.

Asymptotic distributions of solutions of ordinary differential equations
with wide band noise inputs; approximate invariant measures.

        The above papers deal with a wide variety of methods and examples
in the modelling, analysis and approximation of systems with wide band
noise inputs, recursive stochastic procedures and adaptive control problems.

<u>Invited Lectures by H.J. Kushner</u>

Conference on Stochastic Systems, September, 1980, Budapest;
IFID Conference on Recent Advances in Filtering and Optimization, Feb. 1982,
Mexico;
Conference on Decision and Control, December 1981;
Joint Automatic Control Conference, August, 1980;
International Symposium on Information Theory, January, 1981.

Papers by W.H. Fleming

Optimal exit probabilities and differential games, in Applied Math. and Optimization (1981).

Optimal control for partially observed diffusions, SIAM J. on Control and Optimization (1981).

Nonlinear semigroup for controlled partially observed diffusions, SIAM J. on Control and Optimization (1981).

Stochastic calculus of variations and mechanics, J. Optimization Theory and Applications (special issue dedicated to L. Cesari, 1982).

Optimal control and pathwise nonlinear filtering for nondegenerate diffusions, Proc. 20th IEEE Conference on Decision and Control, Dec. 1981. A more detailed paper on this topic is in preparation.

Optimal control of stochastic integral equations and Hamilton-Jacobi-Bellman equations, Proc. 20th IEEE Conf. on Decision and Control, Dec. 1981.

Stochastic control problem for reflected diffusions in convex bounded domain, Proc. IFIP Working Conference on Recent Advances in Filtering and Optimization, Cocoyoc, Mexico (1982).

Invited Lectures by W. H. Fleming

Summer 1980, American Math. Society meeting;
IFIP Working Conference on Stochastic Differential Systems (Hungary), Sept.1980;
Semester on Mathematical Theory of Optimal Control (Poland), Sept. 1980;
University of Oklahoma (Karcher Lecture), Nov. 1980.
INRIA International Conference on Analysis and Optimization of Systems (France) Dec. 1980;
University of Maryland (College Park and Baltimore Co.),March 1981;
Courant Institute of Math. Sciences, April 1981;
Bell Labs, Homdel, April 1981;
Math. Research Center, Univ. of Wisconsin, April 1981;
IEEE Conf. on Decision and Control, Dec. 1981;
IFIP Working Conference on Recent Advances in Filtering and Optimization, Feb. 1982 (Fleming chairs the International Program Committee).

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This report summarizes the results of research produced under this grant, and lists titles of papers produced.

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